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(54) Disappearing sliding door

(57) The present invention relates to an improved disappearing sliding door, to be provided on a wall (P), said door comprising at least a wing (1), a counter-frame providing a box (6) suitable to contain said at least a wing (1)in the open position of the sliding door, and sliding means provided on said at least a wing (1), suitable to guide said wing between said open position and a plurality of partial closure positions up to a total closure position, wherein it completely closes the wall (P) part destined to the door, and vice versa, said door being characterised in that said at least a wing (1) is comprised of a first and a second panel (2, 3), spaced substantially parallel each other, and in that it provides motion means (5, 7, 8, 9, 17, 18, 19) of said first and second panels (2, 3) between a first maximum proximity position, in correspondence of said door open position, and a second maximum distance position, corresponding to the thickness of the wall (P) on which the door is positioned, in correspondence of said total closure position, wherein it completely closes the wall (P) part destined to the door.

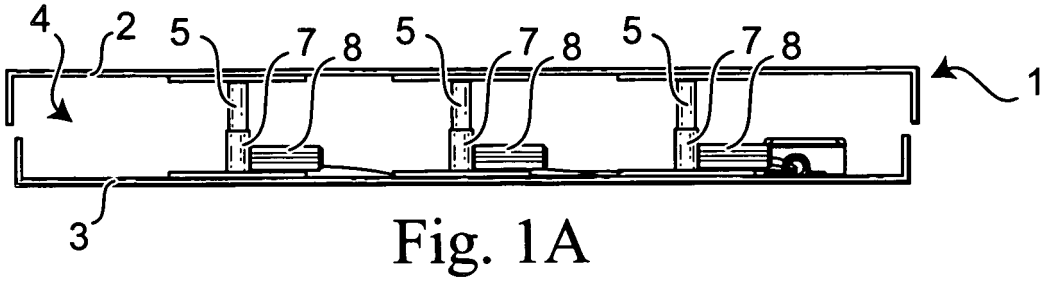

Fig. 1A

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Description

[0001] The present invention relates to an improved disappearing sliding door.

[0002] More specifically, the invention concerns a sliding door particularly studied and realised so that, when in the closure position, it can vary its thickness so as to be confused or camouflaged with the wall on which it is installed.

[0003] As it is well known, many systems for sliding doors exist at present. Said systems have been initially realised in order to recover space, also taking into consideration tendency to live in always more reduced spaces. Mainly in big cities, in fact, said solutions are wide!y used for storeroom, kitchens and bathrooms.

[0004] Said sliding doors have been recently also employed in not domestic environments, such as hotels and restaurants, permitting realisation and designing of more spacious and comfortable rooms.

[0005] This kind of doors is mainly comprised of at least a sliding wing and at least a counter frame. Said counter frame is comprised of a metallic box, a sliding crosspiece and an upright.

[0006] Metallic box replaces with its dimensions the part of the wall on which said door is provided. When the door is closed, its wing completely enters within the metallic box.

[0007] At present, sliding doors became an important design element, also in view of modern tendency of interior architecture. Therefore, they have been used not only to save space but more generally for creating a separation between domestic spaces used in different moments of the day.

[0008] Just in view of the above tendency, sliding doors systems developed in order to reduce dimensions and finishing fittings, making sliding doors always less visible as well adapted for curved walls.

[0009] Doors are presently available on the market permitting avoiding use of doorposts or frames in order to cover profiles, as those described in the Italian Patent Application n° FO2002A000009 filed by the same applicant. In the above solution, sliding system is anchored to a frame housed within the upper edge of the door wing. This permits partially inserting the upper side of said wing, when the door is installed, within the wall, thus covering the sliding mechanisms.

[0010] However, by the above systems, door wing, even when closed against the swingdoor, is visible with respect to the wall. In fact, it has a thickness in any case lower than the containment box thickness, and thus than the wall thickness.

[0011] Object of the present invention is therefore that of providing a sliding door of the kind suitable to be inserted within a box, providing at least a wing with variable thickness that, when closed is equivalent to the thickness of the wall in which the door is provided.

[0012] A second object of the present invention is that of providing necessary devices for varying the door thickness.

[0013] A third object of the present invention is that of providing the door with mechanical and/or electrical actuation and motion means.

[0014] A further object of the present invention is that of permitting a high mounting and use versatility.

[0015] It is therefore specific object of the present invention an improved disappearing sliding door, to be provided on a wall, said door comprising at least a wing, a counter-frame providing a box suitable to contain said at least a wing in the open position of the sliding door, and sliding means provided on said at least a wing, suitable to guide said wing between said open position and a plurality of partial closure positions up to a total closure position, wherein it completely closes the wall part destined to the door, and vice versa, said door being characterised in that said at least a wing is comprised of a first and a second panel, spaced substantially parallel each other, and in that it provides motion means of said first and second panels between a first maximum proximity position, in correspondence of said door open position and a second maximum distance position, corresponding to the thickness of the wall on which the door is positioned, in correspondence of said total closure position, wherein it completely closes the wall part destined to the door.

[0016] Always according to the invention, at least one of said panels can have a substantially cross section broken line "C" shape, said panels being provided in such a way that their concavity are faced each other.

[0017] Still according to the invention, each one of said panels can have a substantially cross-section broken line "C" shape.

[0018] Advantageously, according to the invention, said second panel can be contained within said second panel when said wing is in the open position, or the vertical lateral edges of said first and second panels can match when said wing is in the open position.

[0019] Still according to the invention, said motion means can comprise a plurality of actuators placed on said first and second panel surfaces.

[0020] Advantageously according to the invention, said actuators can be electro-mechanical actuators and can comprise an electric motor.

[0021] Preferably according to the invention, said actuators can comprise a piston - cylinder assembly.

[0022] Furthermore, according to the invention, said actuators can comprise a spring.

[0023] Always according to the invention, said door can comprise means for dragging said at least a wing, e.g. a piston - cylinder assembly, preferably installed in correspondence of the counter-frame transverse bar.

[0024] Still according to the invention, said door can comprise means for actuating motion means, said actuation means comprising a logic unit, suitable to coordinate actuation of said motion means and of said dragging means.

[0025] Furthermore according to the invention, said actuation means can comprise interface means, such as

an activation button for opening and closing said at least a wing.

[0026] Always according to the invention, said motion means ca comprise at least a rotatably mounted worm screw, and at least a pantograph spacer connected with surfaces of said first and second panels, said pantograph spacer approaching or moving away said first and second panels due to the rotation of the worm screw.

[0027] Advantageously, according to the invention, said motion means can comprise a plurality of pantograph spacers mounted on the same worm screw.

[0028] Preferably, according to the invention, said actuation means can comprise a bevel gear pair coupled with said worm screw.

[0029] Still according to the invention, said actuation means can comprise a key, possibly a removable key, for activating said bevel gear pair.

[0030] Always according to the invention, said actuation means can comprise a handle, preferably a foldable handle, for activation of said bevel gear pair.

[0031] Furthermore, according to the invention, said at least a wing can have a plane surface or it can be curved.

[0032] Still according to the invention, said door can have one wing or two wings.

[0033] Advantageously according to the invention said door can provide a lower sliding track.

[0034] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1A is a top section view of a wing of the disappearing sliding door according to the present invention when in its maximum thickness configuration;
figure 1B is a top section view of a wing according to figure 1A when in its minimum thickness configuration;
figure 1C is a top section view of a wing according to figure 1A when inserted within the box;
figure 2A is a top section view of a second embodiment of a wing of the disappearing sliding door according to the present invention when in its maximum thickness configuration;
figure 2B is a top section view of a wing according to figure 2A when in its minimum thickness configuration;
figure 2C is a top section view of a wing according to figure 2A when inserted within the box;
figure 3 is a front section view of the door according to the invention when closed;
figure 4 is a front section view of the door according to the invention when open;
figure 5A is a top section view of a third embodiment of a wing of the disappearing sliding door according to the present invention when in its maximum thickness configuration;
figure 5B is a top section view of a wing according to figure 5A when in its minimum thickness configuration;
figure 5C is a top section view of a wing according to figure 5A when inserted within the box;
figure 6 is a front section view of the door according to the invention when closed;
figure 7 is a front section view of the door according to the invention when open;
figure 8 is a perspective view of the door according to the present invention when open; and
figure 9 is a perspective view of the door according to the present invention when closed.

[0035] Making reference to figures 1A, 1B and 1C, it is possible observing a wing 1 of the door according to the present invention.

[0036] Said wing 1 is comprised of two panels 2, 3 with a substantially cross section broken line "C" shape, and with their concavity faced each other. Panel 2 has surface dimension bigger than panel 3, so as to completely contain the same.

[0037] A cavity 4 is created between said panels 2 and 3, enclosed within wing 1 volume, a plurality of actuators 5 being fixed within said cavity 4, said actuators 5 being suitable to reduce the wing 1 thickness, and consequently, cavity 4 volume, approaching said panel 3 to the panel 2, thus making the former entering within the latter.. wing 1, reducing its thickness, can be housed within a box 6, said wing sliding along direction A.

[0038] Analysing more specifically the figures, it is possible observing that in the embodiment described actuators 5 are of the kind comprising a piston - cylinder assembly 7 and an electric motor 8.

[0039] By a switch (not shown in the figures), electric motor 8 is activated and actuator 5 piston - cylinder assembly 7 permits approaching (moving away) of panels 2, 3. actuators 5 are activated at the same time, so as to permit a uniform and dynamically constant reduction of the door 1 thickness.

[0040] Figures 2A, 2B, 2C show a second embodiment of variable thickness wing 1 of the door according to the invention, wherein a different kind of actuator 5 is provided, comprising a spring 9, maintaining panels 2, 3 spaced each other.

[0041] Electro-mechanical actuator 5 is placed along the axis of the spring 7. The following effects are obtained by the action of said spring:

- during the wing 1 thickness extension, spring tends to amortize actuator 5 action, avoiding, after the opening of said wing 1, possible acceleration between the panels 2, 3;
- during the wing 1 thickness reduction, spring 9 tends to facilitate the actuator action, thus also permitting a power saving.

[0042] Figures 3 and 4 show a front section view of a

door with one wing 1 when closed. Actuators 5 are distributed all along the inner surface of the wing 1.

[0043] From the figure, it is possible observing also the structure of the door counter-frame, comprised of the box 6, a sliding bar 10 and a vertical rod 11. It is also possible observing network 6' of containment box 6.

[0044] Wing 1 can slide among a lower track (not shown in the figures) by wheels 1' provided under said wing 1.

[0045] Actuators 5 placed within the door 1, on panels 2, 3 surfaces, are connected by electric wires 12, provided within a box 13, possibly containing transformer (not shown in the figures). Supply cable 14 is kinked, so as to reduce or increase its length when the wing 1 is closed or open.

[0046] A further actuator 5 is provided above the door 1, in correspondence of the bar 10, said actuator providing a piston - cylinder assembly. Said actuator 15 permits dragging of wing 1from/within said box 6.

[0047] By the control 16 provided on the wall P, the user can open or close the door suitably activating actuators 5 and 15.

[0048] Particularly, in order to pass from the open configuration to the closure configuration, electro-mechanical actuators 5 first reduce wing 1 thickness and then actuator 15 drags the same wing within the box 6, making it sliding on said wheels along the lower track.

[0049] Making reference to figures 5A, 5B and 5C, it is possible observing an embodiment wherein actuators 5 are replaced by a mechanical system provided between the panels 2, 3.

[0050] Said system provides a worm screw 17 and pantographs 18 coupled with said worm screw 17 by inertly threaded cylinders 19. Rotating said worm screw 17, cylinders 19, the inner threading of which is suitably oriented, tendon to move away or approaching according to directions B. Thus, pantographs 18 narrow or extend, respectively approaching or moving away panels 2, 3.

[0051] Worm screw 17 is actuated from outside, i.e. by the user, by a key 20 or by a suitable handle, suitable to act on a rotating transmission element, such as a bevel gear pair 21.

[0052] Key 20 can be of the extractable kind, as shown in figure 5B, or of the foldable type, in order to prevent any obstruction after the insertion of wing 1 within box 6.

[0053] Obviously, it is possible providing electrically activated actuators along with the above mechanic system. Particularly, the latter can be used in emergency situations, e.g. in case of failure of the electricity supply, permitting in any case the opening of the door 1.

[0054] Observing figures 6 and 7, it can be noted that door according to the invention, when open, is absolutely equivalent to a standard sliding door. When said wing 1 is closed, it has the same thickness of the wall P, thus obtaining a noticeable aesthetic effect.

[0055] Wing door can provide on its outer surface the same decoration of the wall P, thus making he same not visible.

[0056] From figures 8 and 9 it is possible appreciating the above, observing a section of the door taken substantially along bar 10.

[0057] Particularly, from figure 8 it is possible observing wing 1 between the closed and the open positions. Thickness of said wing is the minimum thickness and panel 3 is completely contained within panel 2.

[0058] As it can be observed, wall P and wing 1, when the latter is closed, have the same thickness.

[0059] It is possible providing within the scope of the present invention a control logic unit (non shown in the figures), possibly provided with batteries, permitting coordination of actuators during transition from open configuration to closure configuration and vice versa.

[0060] On the basis of the previous specification, it can be observed that basic feature of the present invention is that of permitting the variation of the door wing thickness in the open configuration, thus obtaining a increase of the disappearing effect with respect to the known sliding doors.

[0061] An advantage of the present invention is that of permitting the use of smaller boxes that are also lighter.

[0062] A second advantage of the present invention is possibility of completely automatise opening and closure of the door as claimed.

[0063] A third advantage of the present invention is that of permitting the realisation of doors providing more than one wing, or of curved doors.

[0064] A further advantage of the present invention is possibility of applying to said door the same decoration of the wall on which it is provided, thus permitting its optimum adaptation to the environment.

[0065] The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Improved disappearing sliding door, to be provided on a wall, said door comprising at least a wing, a counter-frame providing a box suitable to contain said at least a wing in the open position of the sliding door, and sliding means provided on said at least a wing, suitable to guide said wing between said open position and a plurality of partial closure positions up to a total closure position, wherein it completely closes the wall part destined to the door, and vice versa, said door being **characterised in that** said at least a wing is comprised of a first and a second panel, spaced substantially parallel each other, and **in that** it provides motion means of said first and second panels between a first maximum proximity position, in correspondence of said door open position and a second maximum distance position, corresponding

to the thickness of the wall on which the door is positioned, in correspondence of said total closure position, wherein it completely closes the wall part destined to the door.

2. Door according to claim 1, **characterised in that** at least one of said panels have a substantially cross section broken line "C" shape, said panels being provided in such a way that their concavity are faced each other.

3. Door according to claim 2, **characterised in that** each one of said panels has a substantially cross-section broken line "C" shape.

4. Door according to claim 2 or 3, **characterised in that** said second panel is contained within said second panel when said wing is in the open position.

5. Door according to claim 3, **characterised in that** vertical lateral edges of said first and second panels match when said wing is in the open position.

6. Door according to one of the preceding claims, **characterised in that** said motion means comprise a plurality of actuators placed on said first and second panel surfaces.

7. Door according to claim 6, **characterised in that** said actuators are electro-mechanical actuators.

8. Door according to claim 6 or 7, **characterised in that** said actuators comprise an electric motor.

9. Door according to one of the preceding claims 6 - 8, **characterised in that** said actuators comprise a piston - cylinder assembly.

10. Door according to one of the preceding claims 6 - 9, **characterised in that** said actuators comprise a spring.

11. Door according to one of the preceding claims, **characterised in that** said door comprise means for dragging said at least a wing.

12. Door according to claim 11, **characterised in that** said dragging means comprise a piston - cylinder assembly, preferably installed in correspondence of the counter-frame transverse bar.

13. Door according to one of the preceding claims, **characterised in that** said door comprises means for actuating said motion means.

14. Door according to claim 13, **characterised in that** said actuation means comprise a logic unit, suitable to coordinate actuation of said motion means and of said dragging means.

15. Door according to claim 13 or 14, **characterised in that** said actuation means comprise interface means, such as an activation button for opening and closing said at least a wing.

16. Door according to one of the preceding claims, **characterised in that** said motion means comprise at least a rotatably mounted worm screw, and at least a pantograph spacer connected with surfaces of said first and second panels, said pantograph spacer approaching or moving away said first and second panels due to the rotation of the worm screw.

17. Door according to claim 16, **characterised in that** said motion means comprise a plurality of pantograph spacers mounted on the same worm screw.

18. Door according to claim 16 or 17, **characterised in that** said actuation means comprise a bevel gear pair coupled with said worm screw.

19. Door according to claim 18, **characterised in that** said actuation means comprise a key for activating said bevel gear pair.

20. Door according to claim 19, **characterised in that** said key is a removable key.

21. Door according to claim 18, **characterised in that** said actuation means comprise a handle, preferably a foldable handle, for activation of said bevel gear pair.

22. Door according to one of the preceding claims, **characterised in that** said at least a wing has a plane surface.

23. Door according to one of the preceding claims 1 - 21, **characterised in that** said at least a wing has a curved surface.

24. Door according to one of the preceding claims, **characterised in that** said door has one wing.

25. Door according to one of the preceding claims 1 - 23, **characterised in that** said door has two wings.

26. Door according to one of the preceding claims, **characterised in that** said door provides a lower sliding track.

27. Door according to each one of the preceding claims, substantially as illustrated and described.

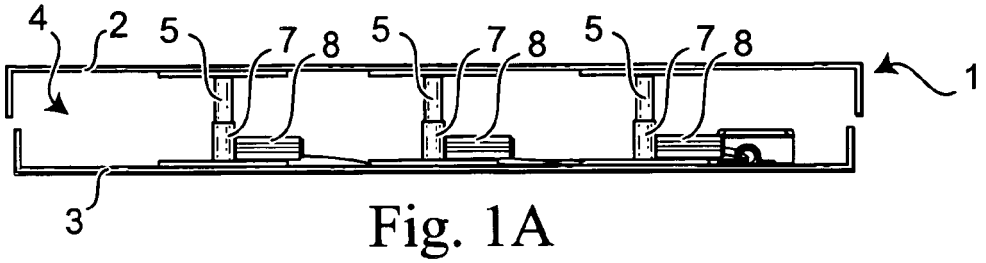

Fig. 1A

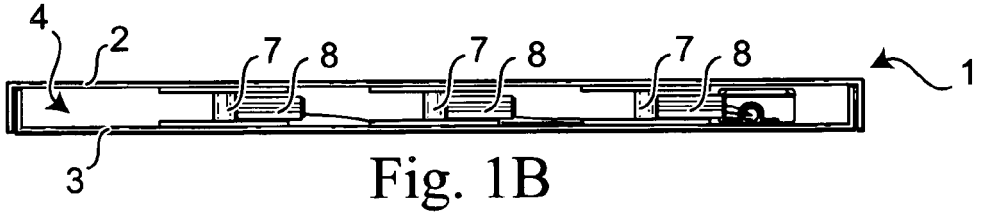

Fig. 1B

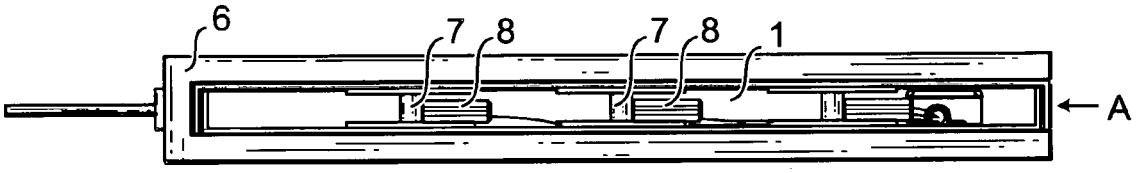

Fig. 1C

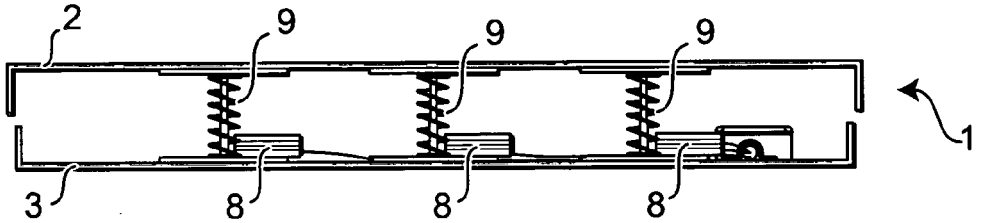

Fig. 2A

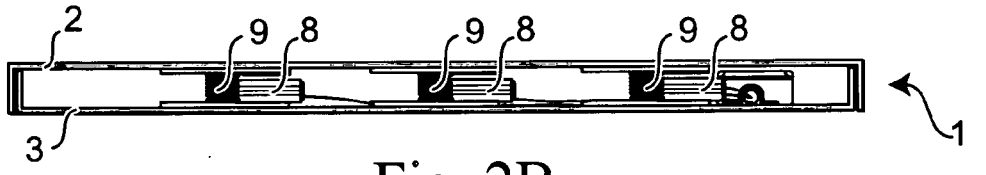

Fig. 2B

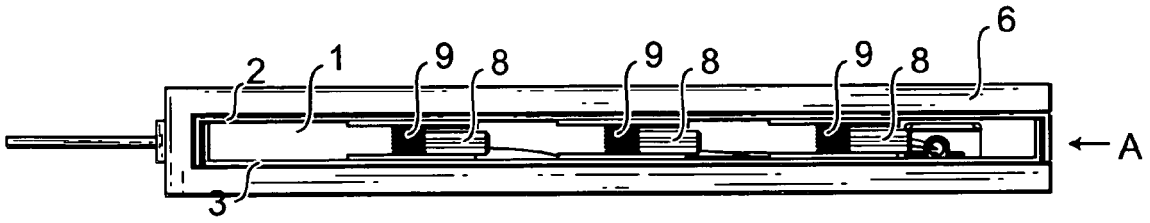

Fig. 2C

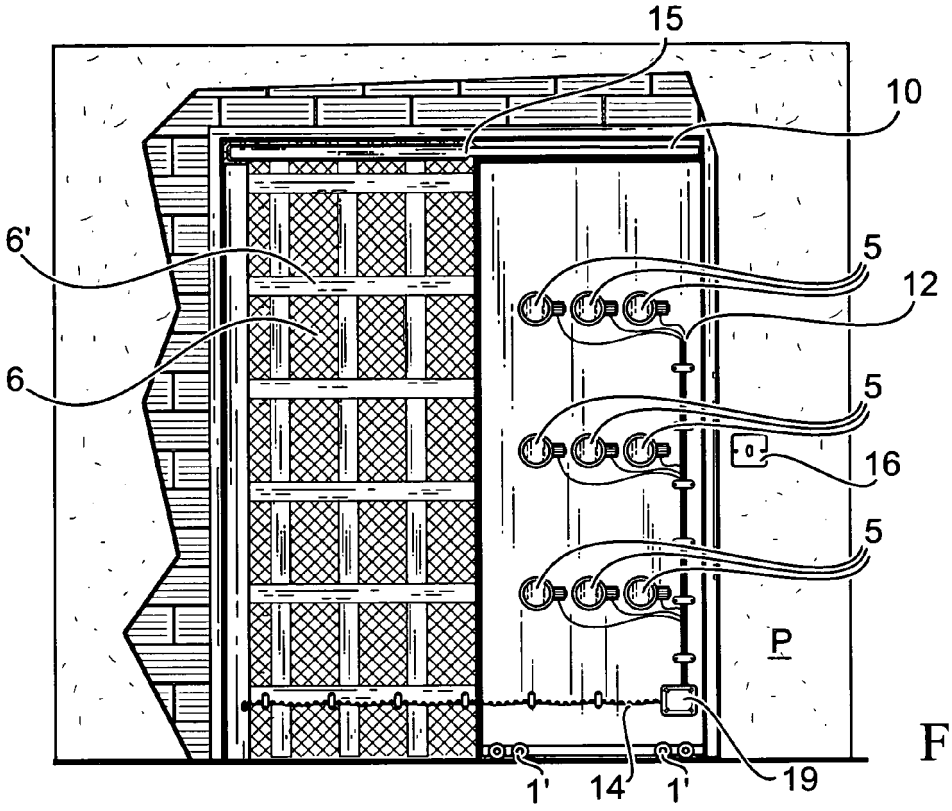

Fig. 3

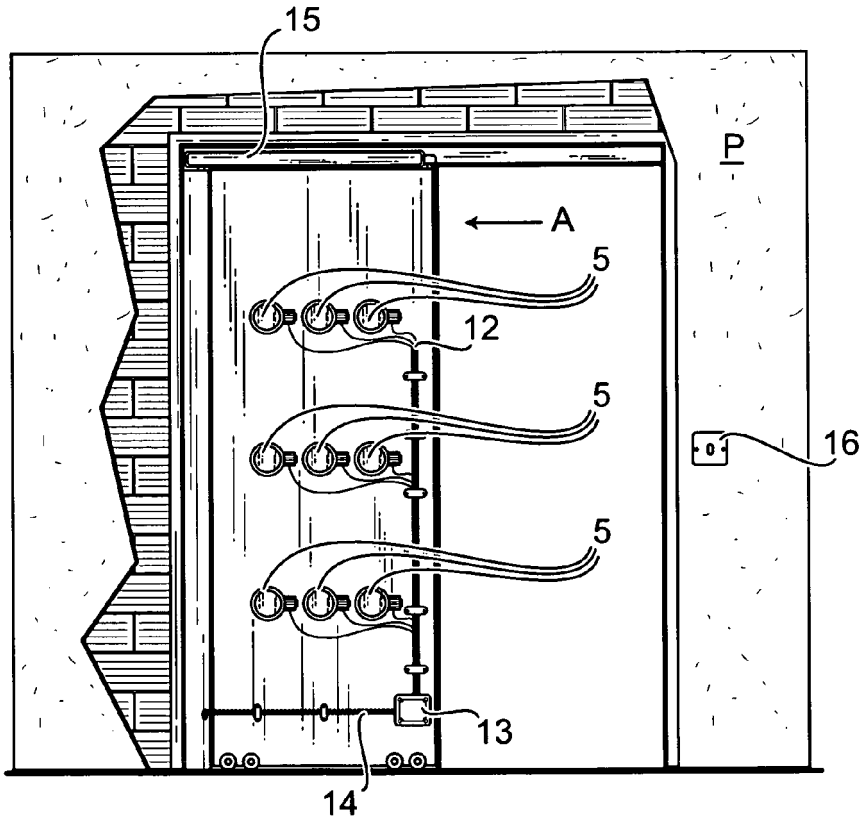

Fig. 4

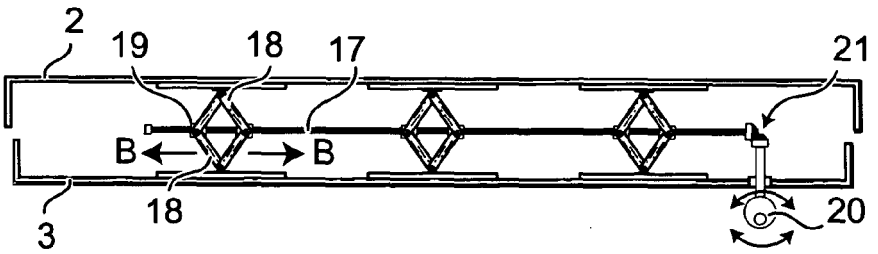

Fig. 5a

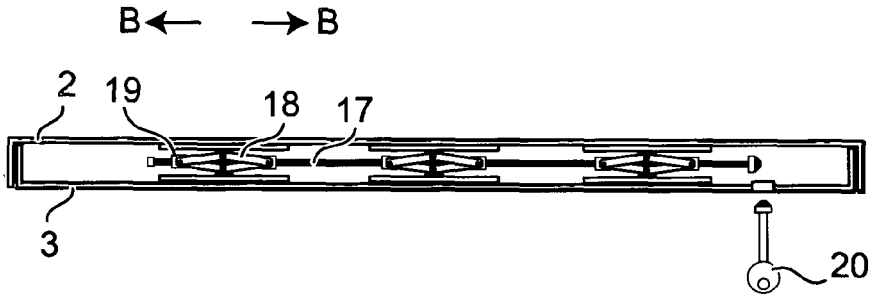

Fig. 5B

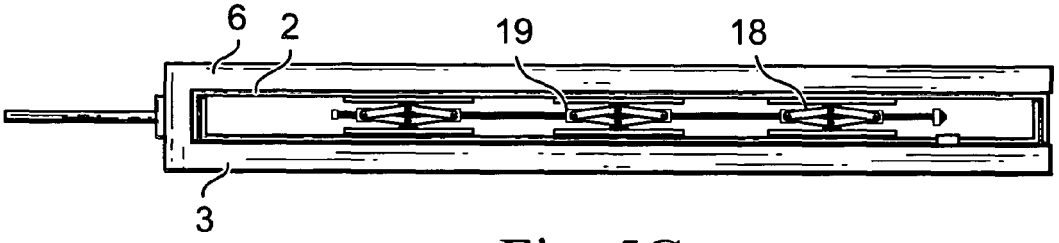

Fig. 5C

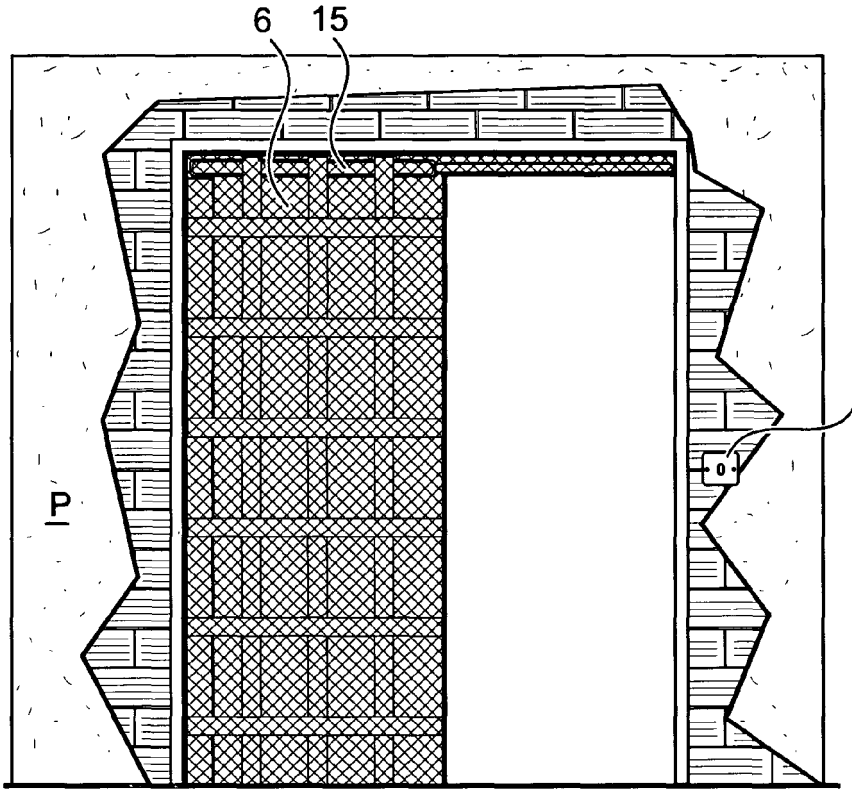

Fig. 6

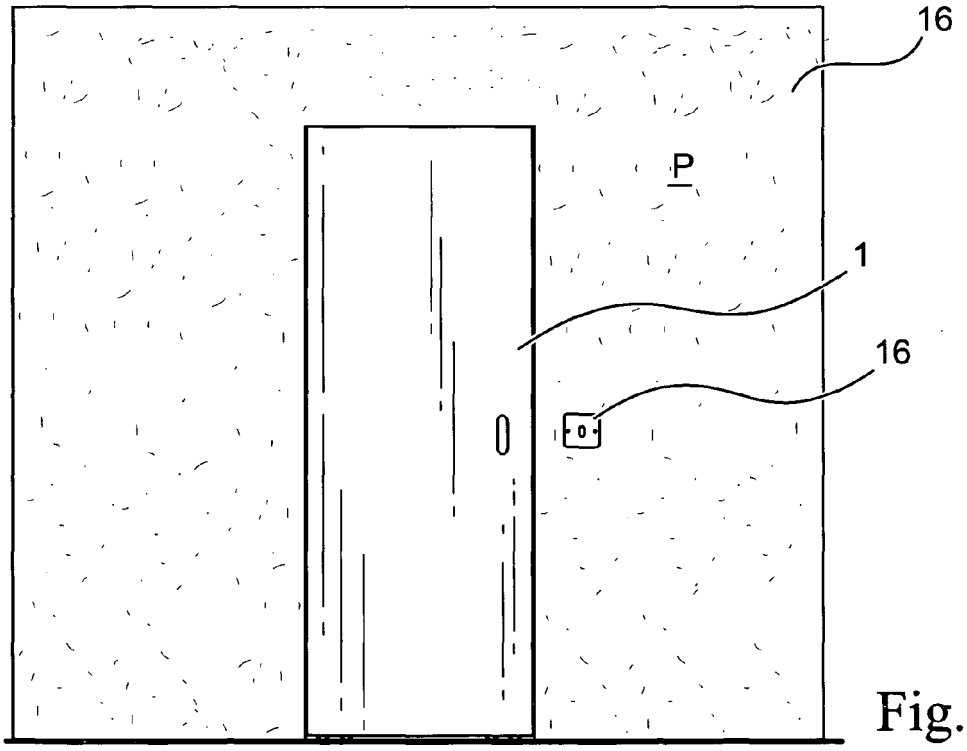

Fig. 7

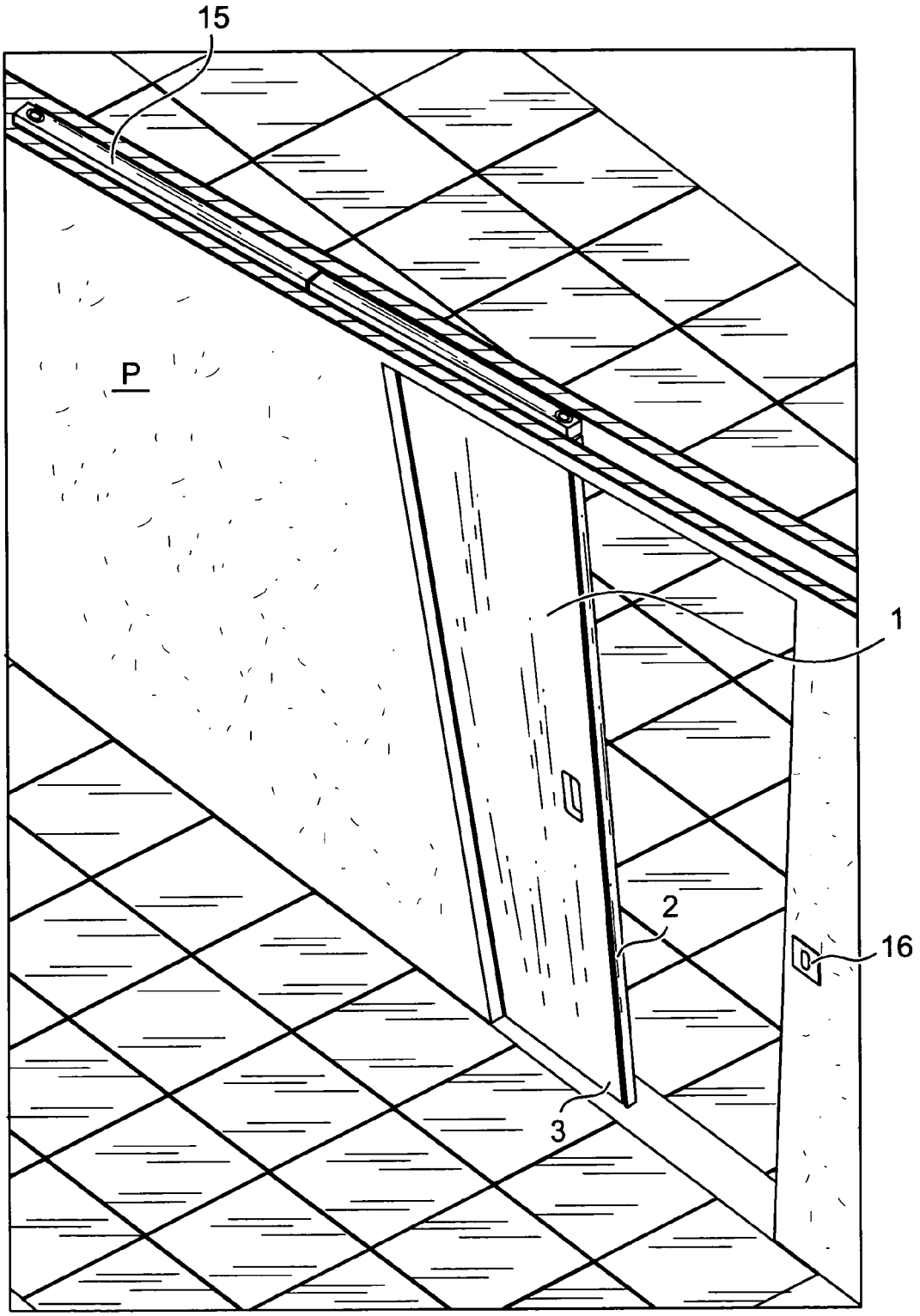

Fig. 8

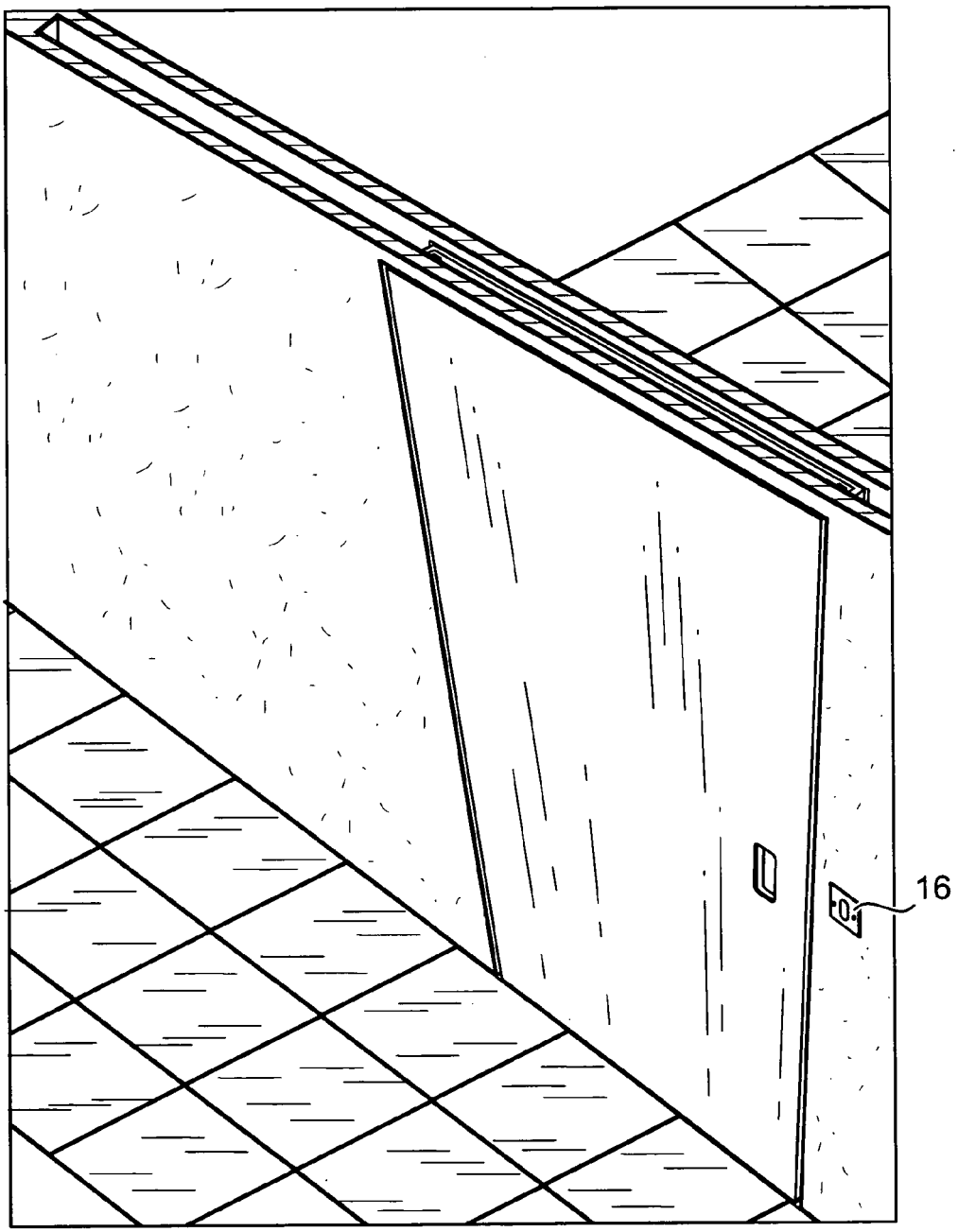

Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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